18	CAS No.: 1330-78-5	Substance: Tricresyl phosphate

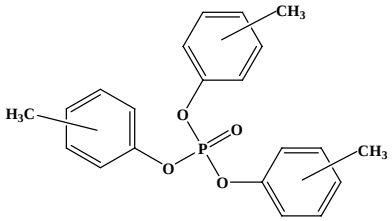
Chemical Substances Control Law Reference No.: 3-2613, 3-2522 (as triphenyl [or monomethylphenyl, dimethylphenyl, nonylphenyl] phosphate) and 3-3363 (as tris [phenyl, monomethylphenyl, dimethylphenyl, ethylphenyl, nonylphenyl mixture] phosphate)

PRTR Law Cabinet Order No.:

Molecular Formula: $C_{21}H_{21}O_4P$

Molecular Weight: 368.36

Structural Formula:



1. General information

The aqueous solubility of this substance is 0.36 mg/L (25°C), and the partition coefficient (1-octanol / water) (log Kow) is 5.11. The vapor pressure is 6.00 x 10^{-7} mmHg (= 8.00 x 10^{-5} Pa) (25°C, extrapolated value). Degradability is judged to be good for o-, m- and p- forms. In terms of hydrolyzability, the half-life at 27°C is 32 - 320 days (pH = 8 - 7). The half-life at 20 - 25°C is approximately one month (pH = 7).

The substance is used primarily for vinyl film for agricultural use, as a compound for electrical wire, as a plasticizer for vinyl chloride resin for construction materials, as a softening agent and plasticizer for synthetic rubber compounds, and additionally as a flame retardant, as a noncombustible operating fluid, as a gasoline additive, as a lubricant additive, and as a jet oil additive. Domestic production in 2003 came to 21,783 tons (as phosphoric acid plasticizer).

---

2. Exposure assessment

As tricresyl phosphate is not a Class 1 Designated Chemical Substance under the Law concerning Reporting, etc. of Releases to the Environment of Specific Chemical Substances and Promoting Improvements in Their Management (PRTR Law), release and transfer quantities could not be obtained. When predictions of distribution ratios by medium were made using the Mackay-Type Level III Fugacity Model, in the event of equal release to the atmosphere, water and soil, the distribution ratio was highest for soil and bottom sediment in the case of all isomers.

The predicted maximum exposure concentration for inhalation exposure to human beings was approximately 0.0024 μg/m^3. In addition, for indoor air, the predicted maximum value based on the data for a limited area (Tokyo) was approximately 0.0092μg/m^3. The predicted maximum oral exposure was estimated to be less than 0.2 μg/kg/day. The vapor pressure of this substance is low at 6.00 x 10^{-7} mmHg, and in the event of release to the atmosphere, a high proportion is predicted to be distributed to soil.

The predicted environmental concentration (PEC) that indicates exposure to aquatic organisms was estimated to be 0.06 μg/L for freshwater and less than 0.03 μg/L for seawater public water bodies.

---

3. Initial assessment of health risk

Exposure to the *o*-isomer of this substance may cause acute symptoms that include headache, abdominal pain, nausea, vomiting and muscle soreness. Subsequently it may have a delayed effect on the central nervous system and peripheral nervous system, resulting in impaired function (paralysis). In severe cases, permanent paralysis may remain as an aftereffect. In addition, it has been reported that the *o*- and *p*- forms cause a moderate degree of irritation to the skin of guinea pig, and the *m*-isomer causes minor irritation, but a mixture of isomers causes no irritation.

There is insufficient information regarding the carcinogenicity of the substance, and it is not possible to make a judgment as to whether it causes cancer in humans. For this reason, an initial assessment of the substance was conducted based on information of non-carcinogenic effects.

As the 'Non-toxic level' was observed, used to estimate the margin of exposure (MOE), a lowest observed adverse effect level (LOAEL) of 4 mg/kg/day (ChE inhibition), obtained from rat medium- and long-term toxicity testings, was obtained for oral exposure. As this was a LOAEL value, it was divided by 10 to establish a value of 0.4 mg/kg/day. For inhalation exposure, a no observed adverse effect level (NOAEL) for human beings of 3.4 mg/m^3 (concentration at which no chronic health effects were observed) was corrected to match the exposure circumstances, with the result that a value of 0.7 mg/m^3 was established.

With regard to oral exposure, when intake of groundwater and food was postulated, the maximum predicted exposure was less than 0.2 μg/kg/day. As the 'Non-toxic level' of 0.4 mg/kg/day and the maximum predicted exposure were established by means of animal testing, the value was divided by 10 to derive an MOE exceeding 200. Accordingly, assessment of the health risk from oral exposure to this substance is thought to be unnecessary at this time.

With regard to inhalation exposure, the predicted maximum exposure concentration in ambient air was estimated at 0.0024 μg/m^3. The MOE derived from the 'Non-toxic level' of 0.7 mg/m^3 and the predicted maximum exposure concentration was 290,000. Moreover, when concentrations in indoor air that have been reported for local areas were used to make estimates for reference purposes, the predicted maximum value was estimated at 0.0092 μg/m^3, and the MOE was 76,000. Accordingly, there is thought to be no need at this time for assessment of the health risk with regard to inhalation exposure to the substance in the ambient air. Moreover, with regard to the health risk from inhalation exposure to indoor air, although the data is from local areas, the MOE of 76,000 was sufficiently large, so there is thought to be comparatively little need for a determination of the concentrations of this substance.

Knowledge of toxicity					Exposure assessment						Judgment
Exposure path	Guidelines for risk assessment		Animal	Impact assessment guideline (endpoint)	Exposure medium	Predicted maximum exposure quantity and concentration		Result of risk assessment			
Oral	No observed adverse effect level	0.4 mg/kg/day	Rat	ChE inhibition	Drinking water / food	–	μg/kg/day	MOE	–	×	○
					Groundwater / food	< 0.2	μg/kg/day	MOE	> 200	○	
Inhalation	No observed adverse effect level	0.7 mg/m^3	Human	Concentration at which no chronic health effects were observed	Ambient air	0.0024	μg/m^3	MOE	290,000	○	○
					Indoor air	–	μg/m^3	MOE	–	×	×

---

4. Initial assessment of ecological risk

With regard to acute toxicity, reliable information of a 48-hour EC_{50} immobilization value of 250 μg/L was found for the crustacea *Daphnia magna* (water flea), and a 96-hour LC_{50} value of 150 μg/L was found for the fish *Lepomis macrochirus* (bluegill). Accordingly, an assessment factor of 1,000 was used, and a predicted no effect concentration (PNEC) of 0.15 μg/L was obtained based on the acute toxicity values. As no reliable information regarding chronic toxicity could be obtained, as the PNEC for the substance, a value of 0.15 μg/L obtained from the acute toxicity for the fish was used.

The PEC/PNEC ratio was 0.4 for freshwater bodies and less than 0.2 for seawater bodies. Accordingly, efforts to gather information are thought to be needed. Particularly with regard to the algae, for which the reliability of toxicity values is thought to be low, efforts to improve knowledge through the implementation of ecological impact tests are thought to be needed.

Hazard assessment (basis for PNEC)			Assessment factor	Predicted no effect concentration PNEC (μg/L)	Exposure assessment		PEC/PNEC ratio	Result of assessment
Species	Acute / chronic	Endpoint			Water body	Predicted environmental concentration PEC (μg/L)		
Fish	Acute	LC_{50} Mortality	1,000	0.15	Freshwater	0.06	0.4	▲
					Seawater	< 0.03	< 0.2	

---

5. Conclusions

	Conclusions		Judgment
Health risk	Oral exposure	Assessment is thought to be unnecessary at this time.	○
	Inhalation exposure	There is thought to be no need at this time for assessment of ambient air. With regard to indoor air, risk cannot be determined, but there is thought to be comparatively little need to determine concentrations.	○
Ecological risk	Requiring information collection. For the algae, efforts to improve knowledge through the implementation of tests are thought to be needed		▲

［Risk judgments］○: No need of further work　▲: Requiring information collection

■: Candidates for further work　×: Impossible of risk characterization